Insect pests of Binuang (*Octomeles sumatrana*) in Sabah

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Abstract. More than 19 insect species were recorded causing damage to Binuang. All are defoliators except one stem-borer. Many are new records. Information pertaining to the description, life cycle and other ecological data of the new records are provided. The occurrence of attack, economic importance, potential threat and management of Binuang insect pests are discussed.

Keywords: Binuang, insect pests, *Octomeles sumatrana*

INTRODUCTION

Binuang (*Octomeles sumatrana* Miq.) of the family Datiscaceae, is an indigenous fast-growing commercial timber species which has been given much attention lately by the State Forestry Department and other forestry stakeholders in Sabah. It is a large lowland evergreen tree that grows up to 80 m tall with a bole diameter up to 2 m. This species has been used as a substitute for the light hardwood dipterocarps (Lee *et al.* 2005). Not much has been documented on insects associated with Binuang, e.g. Robinson *et al.* (2001) and Nair (2000), except for some recorded by Chey (1996 & 2005) and Shim (1973) from Sabah. The insect pests documented from this study are additional information to practising foresters, planters and researchers, and are mostly new records based on Robinson *et al.* (2001). As pointed out by Chey (2005) and Nair (2007), it is useful to know the pests associated with these native tree species as a precaution against possible pest outbreak.

MATERIALS & METHODS

Surveys were carried out at various forest reserves, Forest Management Units (FMUs), experimental plots and nurseries in central and eastern Sabah (Figure 1). Insects that were found damaging Binuang were collected manually while surveying the plots. Pictures of the attacked area and the specimens were taken and the extent of the damage was recorded. In most cases, the damage was caused by larvae of insects, and thus the larvae were sampled and reared in plastic containers to monitor their life cycle. When the adult emerged, it was dry-mounted for identification, based on reference materials at the Forest Research Centre, Sepilok.
RESULTS & DISCUSSION

More than 19 species of insects were recorded causing damage to Binuang in this study (Table 1). The frequency of attack or occurrence of each insect pest was recorded from all surveyed sites. Most of them were moth larvae feeding on leaves of Binuang. There was a stem-borer from the moth family Hepialidae. As expected, the commonest insect was a leaf-miner, *Aiteta deminutiva* Warren (Lepidoptera: Nolidae), which was found in all surveyed sites. However, in terms of economic importance, this insect was not as injurious as a stem-borer despite its high occurrence. Moreover, this leaf-miner was small in size and not a gregarious feeder. Details of this species are provided by Chey (1996) and Holloway (2003).

The armyworm *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae) was encountered a few times feeding gregariously on Binuang seedlings in nurseries and also newly-planted saplings in the field. The attack was recorded earlier by Chey (2005). It is a polyphagous pest of considerable economical importance throughout South-east Asia (Hill & Abang 2005). Various species of bagworms (Lepidoptera: Psychidae) were observed feeding on the leaves of Binuang. Throughout the study, none of the documented insects have caused serious damage to the tree. Many were recorded for the first time attacking Binuang and their occurrences were low to moderate. The description, life cycle and other ecological information of the new records are provided in this paper.
Table 1. Insects recorded from Binuang (*Octomeles sumatrana*) in this study.

<table>
<thead>
<tr>
<th>Order</th>
<th>Family</th>
<th>Species</th>
<th>Damage</th>
<th>Occurrence*</th>
<th>Record</th>
</tr>
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<tr>
<td>Lepidoptera</td>
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<td><em>Endoclita</em> sp.</td>
<td>Stem</td>
<td>Low</td>
<td>New record</td>
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<td>Noctuidae</td>
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<td>Chey (2005)</td>
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<td>Various species</td>
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<td>High</td>
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<td>Leaf</td>
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<td>Chey (1996)</td>
</tr>
<tr>
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<td><em>Olene mendoza</em> Hubner</td>
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<td>Moderate</td>
<td>New record</td>
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<tr>
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<td>Leaf</td>
<td>Moderate</td>
<td>New record</td>
</tr>
<tr>
<td>Lepidoptera</td>
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<td><em>Calliteara horsfieldii</em> Saunders</td>
<td>Leaf</td>
<td>Low</td>
<td>New record</td>
</tr>
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<td>Lepidoptera</td>
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<td><em>Lymantria temburong</em> Holloway</td>
<td>Leaf</td>
<td>Low</td>
<td>New record</td>
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</tr>
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<td><em>Argyrogramma ?signata</em> Fabricius</td>
<td>Leaf</td>
<td>Low</td>
<td>New record</td>
</tr>
</tbody>
</table>

* Low = recorded only from 1 surveyed site
  Moderate = recorded from 2 to 3 surveyed sites
  High = recorded from more than 3 surveyed sites
  Very high = recorded in almost all surveyed sites
Some notes on the new records

*Endoclita* sp. (Lepidoptera: Hepialidae)

The attack by this stem-borer was observed on at least 4 two-year-old trees at the Lungmanis trial plot. During the survey, one of the freshly attacked Binuang trees was felled and two larvae were collected and reared in captivity (Plate 1a). The larvae (measuring 43 mm and 37 mm respectively) looked similar to the *E. aroura* larva in Chey (1996). However, unlike *E. aroura*, the point of the attack entry was not at the base of the trunk but was between 1-1.5 m above the ground, with a hole diameter of 15-20 mm (Plate 1b). Unfortunately the larvae died in captivity, and thus the species could not be identified. *Endoclita* spp. are common pests of *Tectona grandis* and *Gmelina arborea*, both from the family Verbenaceae (Robinson *et al.* 2001).

Bagworms (Lepidoptera: Psychidae)

Throughout the study, various species of bagworms were found feeding on Binuang leaves. These include *Eumeta* spp. and *Amatissa* spp. As the caterpillar inside the portable case grasped the Binuang leaf with its thoracic legs, it fed and caused punctures on the leaf. Some specimens were reared in captivity for more than two months but only two adults emerged, and unfortunately not in good condition.

*Setora nitens* Walker (Lepidoptera: Limacodidae)

As highlighted by Holloway (1986), the name *Setora nitens* used in the economic literature embraces a complex of half a dozen or more species, two of which occur in Borneo. Colour variation in the caterpillars is common. This insect is polyphagous, but it is a serious pest of coconut and oil palm. The nettle caterpillar (Plate 2a) has been known to defoliate large tracts of palms before the outbreak is terminated, often by its natural enemies (Khoo *et al.* 1991). In this study, a few parasitic wasps *Spinaria spinator* emerged from the attacked larvae reared in captivity (Plates 2b & c).

An unidentified limacodid caterpillar was also observed feeding on Binuang seedlings at the Lungmanis nursery. The caterpillar resembled *Darna trima* but was smaller in size, less than 15 mm.

*Eurema* sp. (Lepidoptera: Pieridae)

Some Grass Yellow Butterfly caterpillars were found feeding on Binuang leaves at TSH Nalapak, Ranau (Francis Goh, pers. comm.). A few of the saplings were completely defoliated, especially those adjacent to the *Falcataria moluccana* trees which were also attacked by similar caterpillars. There are a few species of the Grass Yellow Butterfly but the most common in *F. moluccana* plantation is *E. hecabe* Linnaeus. Details of this species are provided by Chey (1996). In this study, the *Eurema* species cannot be determined because the attack was over, and the butterfly and caterpillar were identified based on digital images taken earlier by the plantation manager.
**Olene mendosa** Hubner (Lepidoptera: Lymantriidae)

Specimens were collected from KTS Plantation at the Segaliud Lokan Forest Reserve and TSH base camp at the Ulu Tungud Forest Reserve. The early instar was mostly black with only the first two of the four dorsal tufts well-developed, and it was also sparsely covered with long white setae. The final instar could grow up to 40 mm. It was a colourful and interesting caterpillar (Plate 3a). The four dorsal tufts were yellow; the head, legs and prolegs were crimson; the body was black with some minor white and red markings; the setae were generally white except in the more dense pencils flanking the head, and dorsally at the rear and laterally, where they were black.

Pupation was about a week. Similar with other lymantriids, the pupa was encapsulated within a cocoon woven from its long setae. The adult moth is very variable in appearance (Plates 3b & c), as described by Holloway (1999). This is a polyphagous species, feeding on a wide range of plants (Robinson *et al.* 2001).

**Trabala irrorata** Moore (Lepidoptera: Lasiocampidae)

Larvae of this species were collected from TSH base camp and KTS Plantation. At the early instar, the sparsely hairy caterpillar was light yellow in colour with black bands across its body and a reddish head (Plate 4a). The caterpillar eventually became darker, with more hairs and prominent reddish legs and head towards the middle instar (Plate 4b). At the later instar, the caterpillar had two anterolateral processes with brown hair pencils on the prothorax (Plate 4c). There was a prominent white band along the upper surface of the body, margined with fine blue-black setae and long fine black hairs. The rest of the body had an extremely dense covering of fine shaggy brown hair and thin lateral white tufts. The head had some yellow markings. A mature caterpillar could measure up to 60 mm. The entire larval stage was about 1.5-2 months, while the pupal stage was about two weeks. The pupa was in a saddle-shaped cocoon, covered with hairs of the larva. The adult moth was striking yellow in colour with a wing span of 55 mm and a body length of 26 mm (Plate 4d). Holloway (1987) reported that this is the most abundant lowland species of *Trabala* in Borneo.

**Hypomeces squamosus** Fabricius (Coleoptera: Curculionidae)

This is the only non-lepidopteran insect recorded from the study, feeding on Binuang leaves (Plate 5). Known as the gold dust weevil, it is a very common pest attacking a wide range of plants, with 42 different hostplants recorded in Malaysia alone (Hill & Abang 2005). Information on this species is easily available, e.g. Chey (1996) and Khoo *et al.* (1991).

**Pelagodes** sp. (Lepidoptera: Geometridae)

Some caterpillars and pupae of this looper species (subfamily: Geometrinae) were collected from Lungmanis. Pupation was about a week. The adult moth was relatively plain, dark green in colour with some simple white markings (Plate 6). The wings were fringed with fine brown hairs. The body length was about 14 mm while the wing span was about 34 mm. This is one of several similar-looking *Pelagodes* spp. (Holloway 1996).
Calliteara horsfieldii Saunders (Lepidoptera: Lymantriidae)

Only one specimen was collected from KTS Plantation (Plate 7a). The emerged adult was a female white-coloured moth (Plate 7b), which was larger, paler and only lightly marked compared to the male. Details of this species are given by Chey (1996), Holloway (1999) and Chung et al. (2006).

Lymantria temburong Holloway (Lepidoptera: Lymantriidae)

One specimen was collected from TSH base camp. The caterpillar resembled Olene mendosa, also from the Lymantriidae family, but L. temburong had only 3 yellowish dorsal tufts and without lateral white and black tufts (Plate 8a). In addition, the long setae on the L. temburong body were more yellowish. A mature caterpillar was about 20 mm and pupation was about six days. The adult moth was light brown with some slightly darker markings on the forewings (Plate 8b). Its body length was 11 mm with a wing span of 23 mm. It was a female moth, larger than the male. This species is endemic to Borneo (Holloway 1999).

Olene ?inclusa Walker (Lepidoptera: Lymantriidae)

The mature caterpillar, measuring up to 40 mm, was generally brown in colour with four dorsal tufts (Plate 9a). There were two white stripes along the dorsal part of the body, flanking a black stripe in the middle. Pupation was about 10 days. The emerged adult had a body length of 20 mm and a wing span of 55 mm. The forewings were brown, with some darker patterns from the middle to the edge of the wings (Plate 9b). Hindwings were pale brown. The specimen from this study was collected from the TSH base camp, which is adjacent to the ultramafic forest that shares a lot of similarities with heath forest. Binuang is a new hostplant record.

Rhypotoses brooksi Collenette (Lepidoptera: Lymantriidae)

This caterpillar was similar to O. ?inclusa but it was dark brown and smaller in size, measuring only up to 25 mm (Plate 10a). Pupation was about 12 days. The emerged adult had a body length of 18 mm and a wing span of 38 mm. It was dark brown with patterns on the forewings while the hindwings were pale and plain brown (Plate 10b). No information is available on the hostplants (Robinson et al. 2001).

Hyposidra talaca Walker (Lepidoptera: Geometridae)

A few caterpillars of this species, from the subfamily Ennominae, were sampled from TSH base camp. The early instar of this larva was black with 5-6 white rings across the body (Plate 11a), which eventually disappeared at the later instar. A mature looper measured up to 30 mm. The adult emerged after about a week of pupation. The female was larger than the male, and with more crenulate margin. Wing span of the female was 42 mm while the male had a wing span of 28 mm (Plate 11b). This species was reported to be an abundant defoliator on cocoa leaves in Sabah (Chey 1996).
Ectropis bhurmitra Walker (Lepidoptera: Geometridae)

This looper was from the subfamily Ennominae. It was sampled only from the TSH base camp. Although its occurrence was low in the Binuang plot, Chey (1996) reported that E. bhurmitra was the most common defoliator on young Sentang (Azadirachta excelsa) seedlings planted at Segaliud Lokan. This was also a polyphagous species, feeding on various plant species but Binuang is a new hostplant record (Robinson et al. 2001). A mature cylindrical brownish looper measured more than 25 mm (Plate 12a) and the pupal stage was 8 days. The adult moth had a wing span of 28 mm and a body length of 10 mm (Plate 12b). Other description and ecological details of this species are provided by Holloway (1993) and Chey (1996).

Argyrogramma ?signata Fabricius (Lepidoptera: Noctuidae)

This greenish caterpillar of the subfamily Plusiinae was spotted feeding on a young Binuang leaf at the FRC nursery in Sepilok (Plate 13a). The pupal stage was about 12 days. The emerged adult had a body length of 10 mm and a wing span of 20 mm. The forewings were purplish brown while the hindwings were pale brown (Plate 13b). Robinson et al. (2001) recorded a few hostplants, with a number of species from Leguminosae and Solanaceae. Other details are given by Holloway (1985).

Economic importance and management of Binuang insect pests

Although many species of insects were recorded associated with Binuang from this study, especially defoliators, they did not seem to cause significant damage that would affect the tree health and growth. Moreover, as a fast-growing species, Binuang generally recovers fast from any defoliation. Thus, chemical control is not really necessary. However, for nursery and newly-planted seedlings, pest surveillance and monitoring are crucial. Some of the young seedlings at the FRC nursery were completely defoliated on a few occasions by the gregarious armyworm Spodoptera litura. In such cases, chemical spraying is recommended. Insecticides which are less harmful to the environment or biocides should be used instead of persistent broad-spectrum chemicals (Chey 2005). From the observation in this study, it was the non-insect pests that have caused serious damage to some newly-planted Binuang seedlings at the Lungmanis trial plot. More than one hundred seedlings (23% of the planted seedlings) were damaged by rats Rattus spp., as they attacked the young and soft stem (Chung et al. 2007).

Stem-borers, e.g. Endoclita sp., can be serious pests if infestation is high. They are obviously the most injurious pests (Chey 1996) as they attack the stem and some penetrate into the heartwood, which at times may result in mortality. For Binuang attacked by Endoclita sp., 2% chlorpyrifos solution can be injected into bored tunnels with oil cans or hand pumps (Khoo et al. 1991).

Bagworms and nettle caterpillars can be potential threats because of outbreaks that occasionally occur in oil palm plantations. Sabah has the largest oil palm planted area in Malaysia, covering about 16.6% of its land area (Hoong & Salim 2007), and many bagworms and nettle.
Caterpillars are polyphagous. Thus, they may easily attack Binuang trees adjacent to oil palm plantations. Regular monitoring is crucial to ensure the pests are contained. It is recommended to use virus and cordyceps extracted from the infected caterpillars to reinfect the healthy ones (Hoong & Salim 2007). Selective insecticides with short life span will only be used when necessary.

Heavy defoliation by the *Eurema* butterflies on *Falcataria moluccana* was reported in the past (Chey 1996, Nair 2000). The caterpillars often build up in large numbers and cause locally widespread defoliation. The infestation, however, is usually transient and the damage is not serious (Nair 2000). However, for young Binuang seedlings and saplings planted adjacent to *F. moluccana*, monitoring is important so that localized chemical spraying can be applied to prevent severe infestation.

Many of the lymantriid and lasiocampid caterpillars are relatively large in size. Thus, they may cause heavy defoliation if occur in high abundance. Severe damage was not observed in this study. This could be due to presence of natural enemies from the understorey vegetation and adjacent forests that suppresses the caterpillar population (Chey et al. 1997, Chey 2006).

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**REFERENCES**


Plate 1a. An exposed larva of *Endoclita* sp. when the trunk was split open.

Plate 1b. An entrance hole in the Binuang stem. (From Sabah Forestry Department 2008)
Plate 2a. A healthy larva of *Setora nitens*.

Plate 2b. A dead larva attacked by the parasitic wasp.

Plate 2c. *Spinaria spinator*. 
Plate 3a. The larva of *Olene mendosa*.

Plate 3b. The adult moth.

Plate 3c. Another adult but with different pattern.
Plate 4a. Early instar of *Trabala irrorata*. (From Sabah Forestry Department 2008)

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Plate 4c. Late instar.

Plate 4d. The adult moth.
Plate 5. The gold dust weevil, *Hypomeces squamosus*.

Plate 6. The adult moth of *Pelagodes* sp.
Plate 7a. Early instar of Calliteara horsfieldii.

Plate 7b. The adult moth (female).
Plate 8a. The larva of *Lymantria temburong*.

Plate 8b. The adult moth.
Plate 9a. A mature caterpillar of *Olene inclusa*.

Plate 9b. The adult moth and cocoon case.
Plate 10a. The larva of Rhypotos brooksi.

Plate 10b. The adult moth.
Plate 11a. Early instar of Hyposidra talaca.

Plate 11b. The adult moth (male).
Plate 12a. The larva of *Ectropis bhurmitra*.

Plate 12b. A newly emerged moth.
Plate 13a. The larva of *Argyrogramma signata*.

Plate 13b. The adult moth.